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NOTES AND COMMENTS.

"THE DEVONIAN SYSTEM IN CANADA." Being an address by J. F. Whiteaves, F.G.S., Paleontologist and Zoologist of the Geological Survey of Canada, as Vice-President and Chairman of Section E (Geology and Geography) of the American Association for the Advancement of Science. Delivered August 21st, 1899. Published as separate by Amer. Assoc. Adv. Sc., 48th Ann. (Columbus meeting). 31 pp. The Chemical Publishing Company, Easton, Pa., 1899:

Mr. Whiteaves begins by defining the term "Devonian" according to Sedgwick and Murchison in 1839, ascribing to Lonsdale the distinction of having established it in December, 1837, on purely paleontological grounds. He goes on and considers the progress made in Canada up to the present, making the following geographical divisions:—

I. THE MARITIME PROVINCES AND QUEBEC.

Touching Nova Scotia and New Brunswick geology, much obscurity still exists, but no attempt is made to clear the mist from the complicated problems involved in that portion of Canada. Mr. Whiteaves gives the views of Dr. Abram Gesner, Sir Wm. Dawson, Dr. Honeyman, Dr. R. W. Ells and Mr. Hugh Fletcher without comments. The views of Prof. David White, of the U.S. National Museum at Washington, of Mr. Robert Kidston, of Stirling, Scotland, on certain fossiliferous rock-formations occurring unconformably below the marine carboniferous limestones of Eastern Canada, are added as those of specialists who base their opinions upon the evidence afforded by the fossil organic remains entombed in the rocky formations, which by Gesner, Fletcher and Ells are called Devonian, and by Sir Wm. Dawson and the writer as Carboniferous.

On independent grounds Dr. White and Mr. Kidston corroborated the

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Carboniferous views of the subject, and since the publication of this "Address" the views of Mr. A. Smith Woodward and of Dr. Henry Woodward and Prof. T. Rupert Jones have been received, and further corroborate the views held by Dr. White and Mr. Kidston. The Mispéc and Lancaster formations of New Brunswick hold the same taxonomic relation to the other palaeozoic sediments of the geological column in New Brunswick that the Union and Riversdale formations do in Nova Scotia. The flora and fauna of both are practically identical—the ferns, worms and insects, etc., of the former are found in the latter, and must be referred to one and the same horizon. From this it would appear that much of what has been called Devonian in New Brunswick will have to go up into the Carboniferous system and certain measures in Nova Scotia placed in the Millstone Grit formation, viz., the "Millstone Grit of Riversdale, etc.," will have to go down from the Middle or Meso-Carboniferous to the Early or Eo-Carboniferous. It will thus bring the palaeozoic sediments of New Brunswick and Nova Scotia which belong to the same Eo-Carboniferous period in the same position in the geological column of rock-formations—a place which both from stratigraphical as well as from palaeontological evidence they hold. There is no divergence of opinion between the stratigraphical geologists and the palaeontologists as to the position of "rocks of Union and Riversdale" in the sequence of geological formations. The only point at issue is where to draw the dividing line between the Carboniferous and the Devonian. Mr. Fletcher, in his Nova Scotia work, draws the line at the base of the limestone or marine series. I would draw the line below the Union and Riversdale formations on the ground that the entire character of the abundant fauna and flora these formations contain, viz., erect trees, ferns, calamites, lycopodiaceous plants, ostracoda, insects, worms, crustacea in great variety, lamelli branchiata, reptilian remains, etc., etc., have a true Carboniferous *facies*, and can only be classed as Carboniferous in order to be placed in what is recognized the world over as a portion of that system which is marked by coal and coaly strata deposited in shallow water, lagoons and estuaries in which many of the land plants and animals as well as many of the aquatic plants and animals of that period lie buried or on which the latter have left their footprints. The high-class flora and abundant fauna of air-breathers of the St. John plant-bearing-beds (=Lancaster formation) are in my estimation Carboniferous rather than Devonian as to their affinities when compared with the types already recorded from European as well as American equivalents.

One of the characteristic features of the rocks of the Mispéc and Lancaster formations of New Brunswick is that of metamorphism, and this feature it is which gives rise to a suggestion of apparent antiquity.

This factor is evidently a relative one as well as one of local significance, and cannot enter into this argument except with the greatest caution.

In the Summary Rep. of the Geol. Survey for 1897-98, published previous to this Address, the views of the writer on this subject were sufficiently clearly demonstrated to have been referred to.

There are marine sediments of true Devonian age in New Brunswick not referred to by Mr. Whiteaves.

Regarding the Province of Quebec, on p. 16 Mr. Whiteaves quotes Mr. Schuchert as authority for the statement that the limestones of St. Helen's Island, opposite Montreal, belong to "the Hamilton formation of Ontario and New York, and not to the Lower Helderburg," as held by Sir William Dawson, Prof. Donald, Dr. W. E. Deeks, Dr. Ells and the writer. This statement surely needs correction.

Numerous localities and areas recognized as Devonian in the Peninsula of Gaspé and described by Dr. Ells and the writer as Devonian in the Reports of Progress of the Geological Survey for 1880-1-2 and 1882-3-4 are not mentioned in connection with the progress and advancement of geological enquiry in this Province. The record of the discovery of a Meso-Devonian fauna similar to the lamelli branchiata fauna of the Hamilton formation of New York State in the sandstones of Grande Carrière Brook, Gaspé, are of sufficient importance to be noted.

II. ONTARIO AND KEEWATIN, AND III. MANITOBA AND THE N-W. TERRITORIES.

In these districts Mr. Whiteaves has done considerable work, especially in the Hamilton fauna of Ontario and the Meso and Neo-Devonian of Manitoba, Keewatin and the Mackenzie River Basin. His writings are embodied in the Reports of Progress of the Geological Survey of Canada and in "Contributions to Canadian Palæontology."

In the Rocky Mountains region of Canada only preliminary work has as yet been done. The numerous and interesting collections made by Dr. Dawson, Mr. Tyrrell, Mr. McConnell and others in the Crow's Nest, Kootanie and North Saskatchewan Rivers and Valleys have been examined in part by Mr. Whiteaves, and also in 1883 and 1884 and 1886 by the writer. No mention is made of the results obtained in the study of the Devonian fossils of the Kootanie and Crow's Nest Passes some years ago in the Reports of Progress of the Geological Survey of Canada and embodied in Dr. Dawson's "Reconnaissance Map of the Rocky Mountain Region of Canada."

Prof. Meek's work, the work by Dr. Bell, Mr. McConnell and other explorers in the Mackenzie, Athabasca and Clearwater Rivers are all referred to by Mr. Whiteaves, and in a terse paragraph he sums up the knowledge of the Devonian rocks of the Dominion as a whole. He shows also how our knowledge of the fossils of the Devonian of Nova Scotia is still in its infancy, and how in the Rocky Mountains of Alberta the Carboniferous and the Devonian have not been in every instance distinguishable, and our knowledge of the Devonian fossils of Keewatin and the James's Bay region needs to be amplified.

There remains, however, yet to be shown what rock-formations and fossiliferous sediments of Nova Scotia there exist (if any) which are of true Devonian age, besides the marine Devonian strata of the Siluro-Devonian area and axis of Annapolis and Kings Counties in that Province.

H. M. AMI.